U.S. Department of Energy
Office of River Protection
P.O. Box 450
Richland, Washington 99352

01-OSR-0444

Mr. Ron F. Naventi, Project Manager
Bechtel National, Inc.
3000 George Washington Way
Richland, Washington 99352

Dear Mr. Naventi:

CONTRACT NO. DE-AC27-01RV14136 - TOPICAL MEETING MINUTES FROM OCTOBER 2 AND 3, 2001

Enclosed please find the meeting record of the October 2 and 3, 2001, Topical Meetings between the Office of Safety Regulation and Bechtel National, Inc. If you have comments or questions regarding the meeting record, please contact me or Walt Pasciak of my staff, (509) 373-9189. Nothing in this letter should be construed as changing the Contract, DE-AC27-01RV14136. If, in my capacity as the Safety Regulation Official, I provide any direction that your company believes exceeds my authority or constitutes a change to the Contract, you will immediately notify the Contracting Officer and request clarification prior to complying with the direction.

Sincerely,

Robert C. Barr
Safety Regulation Official
Office of Safety Regulation

OSR:WJP

Enclosure

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Meeting Record

IMS: 01-OSR-0444

MEETING PURPOSE: The 25th Topical Meeting between the Office of Safety Regulation (OSR) and Bechtel National, Inc. (BNI): Seismic Probabilistic Risk Assessment (PRA) and Operations Risk Assessment at the River Protection Project-Waste Treatment Plant (RPP-WTP)

MEETING DATE/TIME: October 2 & 3, 2001/1:00 – 5:00 PM

MEETING PLACE: Walkley Room, 3000 George Washington Way, Richland, WA

AGENDA:
1. OSR Opening Remarks
2. BNI discussion of the seismic PRA and operations risk assessment

ATTENDEES: See Attachment 1

PREPARED BY: Ko Chen

CONCURRENCE: Walt Pasciak

KEY DISCUSSION ITEMS:

The meeting began with a welcome from the OSR, the introduction of attendees (Attachment 1) and a review of the meeting agenda. The OSR reiterated that the purpose of topical meetings is to permit timely review of the construction authorization request (CAR) by addressing potentially controversial sections of the Preliminary Safety Analysis Report (PSAR) in advance. The topical meeting protocol was developed in 1998 and is described in Attachment 2.

The number of open issues from past topical meetings was reviewed and included: 10 of 133 issues that were identified during the review of the Initial Safety Assessment Report (ISAR), 64 topical meeting action items, and 14 significant unresolved issues. BNI has not proposed to close any existing open issues and action items since the August 2001 topical meeting.

In transitioning to the BNI agenda for this topical meeting, the OSR identified the pre-meeting activities that occurred to prepare for the meeting. These pre-meeting activities are identified in Attachment 2 and include document submittals and working meetings.

The schedule of remaining topical meetings is as follows:

- The next scheduled topical meeting will be held on December 4, 2001. The topic will be integrated safety management (ISM) Cycle 2 results.

BNI Presentation

After this introduction by the OSR, the BNI portion of the meeting began. BNI stated that the purpose of this topical meeting was to discuss the following two issues:

- Seismic PRA
- Operations risk assessment

Due to the extensive amount of material to be covered during the meeting, the seismic PRA and operations risk assessment discussions were held separately on October 2 and 3, respectively. The BNI agenda is included in Attachments 3 and 4.

Seismic PRA Introduction (Attachment 3)

BNI stated the seismic PRA at RPP-WTP was performed for the following reason:

- While the selected RPP-WTP design basis earthquake (DBE) (DBE horizontal peak ground acceleration =0.26g) has an annual frequency of 5x 10^{-4} per year, the range of RPP-WTP radiation exposure standards (RES) extends to an annual frequency of 10^{-6} per year. BNI decided to perform a seismic PRA to evaluate the seismic response of the facility in the frequency range that goes from 5 x 10^{-4} per year to 10^{-6} per year.

In order to perform the seismic PRA, BNI stated that it had performed dose consequence calculations for facility workers, co-located workers, and the public. For facility workers, the dose contributions included the sum of dose contributions from workers that remain at the facility, and from workers who are being evacuated. The dose contribution for co-located workers and the public included all four directions (north, south, west, and east) of the RPP-WTP site. BNI stated that its seismic PRA approach for the Low Activity Waste (LAW) facility assumed a single, worst case sequence with a probability of 1. This implied the following for the LAW facility:

- Failure of all vessels and components
- Major damages to cell walls and penetrations
- Non-functional cell ventilation system

BNI stated that its seismic PRA approach for the High Level Waste (HLW) facility did not assume a worst-case sequence but included a more complete evaluation of accident sequences and potential dose consequences.

The following is a summary of verbal exchanges between the OSR and BNI on this subject. OSR comments and questions are followed by the BNI responses:

- What does BNI mean when it characterized the seismic results presented as "preliminary"? The seismic results presented in the meeting do not include those from the pretreatment building (PT) due to its re-configuration; therefore, the results are preliminary.
- When will the PT seismic PRA work be completed? Probably, near the end of October, 2001.
- Does the dose contribution calculated by the BNI seismic PRA work include those from facilities other than the RPP-WTP site? No.
- Are seismically induced fire scenarios considered in the PRA work? Fire scenarios induced by seismic events are not considered in the seismic PRA, because there are not enough combustible materials in either the HLW or LAW facility.

<u>Cell Decontamination Factor (DF) Determination and Results (Attachment 3)</u>

BNI stated the development of cell DFs was very important to its dose analyses. In order to develop DFs, four representative damage conditions for the RPP-WTP site were evaluated by BNI. These four damage conditions included: intact, cracked, minor, and major. These conditions are described in detail in Attachment 3. In summary, BNI stated its "intact" and "cracked" cell DF conditions were based on experiments performed by Los Alamos National Laboratory (LANL). The "minor" and "major" cell DFs were derived from data generated by HADCRT computer program. BNI made the following summary for its use of cell DFs in dose calculations:

- The "major" and "minor" conditions were separated by the 100 cm^2 opening size, with "major" being defined as a hole size greater than 100 cm^2. DFs vary as opening sizes increase from 1 to 100 cm^2. However, DFs do not increase further after opening sizes become greater than 100 cm^2.
- For "minor" condition, cell DFs for 1 cm^2 to 100 cm^2 can be used. If the actual opening is less than 1 cm^2, then the use of DF for 1 cm^2 is conservative.
- For "major" condition, cell DFs are the same for hole sizes ranging from 100 cm^2 to 1 m^2. If an actual opening is greater than 1m^2, then the use of DF based on 1 m^2 is acceptable.

The following is a summary of verbal exchanges between the OSR and BNI on this subject. OSR comments and questions are followed by the BNI responses:

- Are DFs derived by BNI applicable to both floor leaks and wall cracks? The derived DFs apply to any confinement boundary.

- What are the particle sizes for the aerosol loadings used by BNI ($10mg/m^3$, $100mg/m^3$, $1g/m^3$)? This has not been evaluated by BNI.
- Are the DFs sensitive to cell volumes considered? They are not.
- Have comparisons of the DFs resulting from HADCRT with DFs from other sources been made? Yes, an initial attempt to compare with Sellafield data was conducted. The limited comparisons generally showed a good agreement.
- What exposure time is considered for the BNI dose calculation? The first 10 minutes.
- How do DFs vary with the pressure in cell? This has not been evaluated.
- Where did the heat load for the estimation of DFs come from? It was assumed to be 7000 Watts of decay heat in the LAW feed tank.
- How were airborne concentrations at the assumed worker locations determined? By applying the calculated DF to the estimated cell concentration. This approach was used to provide a conservative estimate of the air concentration.

LAW Preliminary Results (Attachment 3)

As stated earlier, BNI did seismic PRA calculations for the LAW facility assuming a "major" damage condition. The definition of a "major" damage condition includes the following:

- All components containing radioactivity fail and release their contents, which include spills of all major vessels, glass spills from the LAW melter, and breaks in melter offgas pipes.
- All barriers (e.g., cells) to the release of radioactivity undergo major structure damage.
- C5 filtered ventilation exhaust system is rendered inoperable.

Four different locations of facility workers within the LAW facility were considered by BNI for the dose consequence calculations. These four different locations are described in Attachment 3. For workers located out of LAW facility, four different receptor locations were also considered. They are described in Attachment 3. BNI stated its calculated results showed that the highest dose consequence for workers, co-located workers, and the public are 3.7E-03 rem, 4.97E-04 rem, and 2.81E-06 rem respectively. Therefore, dose consequences for workers, co-located workers, and the public were all well below RES table values.

The following is a summary of verbal exchanges between the OSR and BNI. OSR comments and questions are followed by the BNI responses.

- Was the effect of tank farms on RPP-WTP accounted for? No.
- How much time was assumed for workers to evacuate the building? Workers were assumed to exit the building anywhere from 2 to 10 minutes.
- How many computer simulation runs were made for the calculation? About 10000 runs.
- How was feed concentration handled in the stochastic analysis? The feed concentrations over the plant lifetime were defined as 61% Envelope A. 17% Envelope B, and 22% Envelope C. In the stochastic analysis, a random number between 0 and 1 was generated

and directly related to the portion of feed from Envelopes A, B, and C.

- Page 21 of Attachment 3 contains example information on determining the LAW concentrate vessel contents, as a random function of processing status. This figure needs to be revised and re-submitted since the lack of color contrast makes the hard copy version difficult to decipher. BNI responded it will provide a colored figure in the future.
- Are the assumptions about evacuation time conservative, especially for the stronger earthquakes where workers may be trapped in the facility? No attempt has been made to consider trapped or injured workers in the analysis.

HLW Seismic Performance (Attachment 3)

BNI stated that its seismic approach for the HLW facility consisted of a seismic system analysis and a seismic fragility assessment. The BNI seismic system analysis developed the logic model that defines the potential for seismically-induced accident sequences in the HLW facility that could lead to release of radioactivity, while the BNI seismic fragility assessment quantified conditional probability of failure/damage to systems, structures, and components (SSCs) given the seismic event. The HLW seismic system analysis modeled site support systems, facility confinement and mitigation systems, and potential sources of radiological release. The model consisted of a series of event and fault trees. The details of the model are described in Attachment 3.

The HLW seismic fragility analysis focused primarily on assessment of shear wall and vessel fragility median capacities. For other components, simplified estimates or approaches for seismic capacity were made based on available information. The BNI structure system and shear walls modeling were described in detail in Attachment 3. The HLW shear wall fragility curves derived by BNI are shown on page 42 of Attachment 3. BNI discussed its HLW cell wall penetrations model used to calculate dose consequences (page 44 of Attachment 3). To perform the fragility analysis, BNI divided all vessels in the HLW facility into three groups. The assumptions made by BNI for its vessel fragility analysis are outlined on page 47 of Attachment 3. The HLW seismic fragility estimates of various components are shown on page 49 of Attachment 3.

The following is a summary of verbal exchanges between the OSR and BNI on the subject. The OSR comments and questions are followed by the BNI responses.

- How realistic is it to assume the C5 ventilation system is not available for accidents considered in the seismic PRA? This is not realistic, but survival of the system with increasing ground motion becomes less likely. Although this is a simplifying assumption, the results are considered to be conservative.
- When will the seismic PRA report be completed? It will be next January or February.

HLW Dose Consequences

BNI stated that five major radioactive sources and four cell damage conditions were considered in its HLW dose consequence calculation. The five sources included melter line break, glass spill from the melter, and several vessel groups. Nine vessel groups were initially identified. They are shown on page 45 of Attachment 3. Vessels in the same group are similar in a structural sense and are expected to perform in a like manner during a seismic event. Based on dose screening calculations, these nine vessel groups were further consolidated into three groups. The four cell damage conditions included "intact", "cracked", "minor", and "major". BNI stated that the combination of different damage conditions and radioactive sources resulted in 124 dose calculation cases. For each case, six different locations for facility workers, adjacent facility workers inside LAW vitrification and PT buildings, facility workers evacuating WTP site, co-located workers, and the public were analyzed. These are described in detail in Attachment 3 (pages 54-60).

Based on its calculation results, BNI concluded that there was a small probability of exceeding 25 rem for facility workers at three of the six locations. The probability was 3% at two of the locations and 0.4 % at the third location. For facility workers at other three locations, the probability of exceeding 25 rem is less than 1E-06. For five of the co-located worker locations and for the public, the probability of exceeding 25 rem was less than 1E-06 in each case. For the one remaining co-located worker location, the probability of exceeding 25 rem was 0.14 %. This location is at the west side of the RPP-WTP site and is higher there because of the proximity to the HLW vitrification facility. BNI further stated that the highest dose contributor for facility workers was the glass spill, followed by a failure of vessel group 1. For co-located workers and the public, the highest dose contributor was glass spill, followed closely by off-gas line break and failure of vessel group 1.

<u>HLW Preliminary Results (Attachment 3)</u>

BNI stated the purpose of the seismic quantification was to estimate mean frequency of exceedance of receptor dose levels that could occur as result of seismic events. The following information was required as inputs:

- Mean seismic hazard curve
- Mean seismic fragility for SSCs
- HLW logic model of seismically initiated event sequences
- Conditional probability of exceedance of radiological dose levels for identified receptors, defined for a specific release, confinement state, and mitigation system status

BNI stated that the initial seismic quantification was performed for a reduced HLW model. The reduced HLW model was developed with the following assumptions:

- C5 extract system was assumed to have failed.
- All penetration failures corresponded to "major" damage condition.
- Certain fragility-based vessel groups were combined with other groups due to their low

radiological dose consequences.

BNI stated that the reduced HLW model generated 230 sequences to be analyzed. BNI emphasized that the HLW seismic PRA results were preliminary because contributions from other facilities (PT, LAW) have not been included. The results were summarized by BNI in Attachment 3 (pages 72-85). Based on the results, BNI made the following observations for facility workers regarding major dose contributors:

- Each of the top 10 sequences involved melter glass spill and penetration failure.
- Shear wall failure, as a stand-alone confinement system failure, was not an important contributor.
- Failure of vessel groups appeared in 9 of 10 sequences.

For major dose contributors to co-located workers, BNI made the following observations:

- Important contributors were similar to those for facility workers.
- Melter glass spills appeared in 7 of 10 sequences, along with penetration failures.
- Vessel failures appeared in all of top 10 sequences.
- Again, cell shear wall failures were not important contributors.

Based on the results, BNI made the following summary for its HLW seismic PRA results:

- For all receptors, dose-frequency preliminary results were below the RES table levels, with margin available.
- There was a margin of 2.7 between the DBE and the facility median seismic capacity.
- Results of initial quantification were conservative, and margin was expected to increase following re-quantification, which is BNI's follow-up process to further refine all assumptions and calculations.

The following is the summary of verbal exchanges between the OSR and BNI on the subject. OSR comments and questions are followed by BNI responses:

- The HLW calculations indicate that cell wall penetrations could become the dominant sources of release. Is this realistic or could this information be useful in the design process? Because of the lack of design detail, simplifying assumptions have been made for penetrations that are likely conservative. This information had been provided to the design teams, and the final safety analysis report (FSAR) will contain a more rigorous analysis of the potential impacts of cell wall penetrations.
- Has BNI separately considered floor slabs in the seismic PRA work? No, past experience indicates that floor slabs should not be weaker than walls.
- The dose distribution results do not show enough detail. Can log/log plots of this information be provided to better show the near zero values? Yes.

- Could continued operation of the C5 system, perhaps in a damaged state, increase the dose consequence? No, not for facility workers. It may increase the dose consequence for co-located workers and the public, but it is not likely to challenge the RES table doses.

Operations Risk Assessment Methodology and Interim Report (Attachment 4)

BNI first stated that the WTP operations risk assessment (RA) was so named to prevent confusion between RA activity analyzing non-seismic events and the seismic PRA. BNI stated there are three risk goals defined for RPP-WTP. The objective of performing the RA was to demonstrate the RPP-WTP facility conformance to risk goals. The three goals are:

- Operations risk goals, numerically equivalent to a latent cancer fatality risk of $2x10^{-6}$ per year.
- Accident risk goal, numerically equivalent to a prompt fatality risk of $4x10^{-7}$ per year.
- Worker risk goal, numerically equivalent to fatality risk of $1x10^{-5}$ per year.

BNI stated that there were many factors to consider in its RA methodology selection. These factors included: RA contributions from multiple populations (facility workers, co-located workers, and the public), realistic quantification of accident scenario, and accommodation of varied nature of accidents. BNI emphasized that its RA must maintain direct relationships between each accident sequence and its risk contribution to each target population. To perform the RA, BNI stated that its RA teams relied on results of the BNI integrated safety management (ISM) teams' analyses. BNI's RA teams estimated frequencies and conditional probabilities for design basis events (DBEs) selected from its standards identification plant database (SIPD). The goals were to develop an RA, which is derived from information provided in SIPD and provide consistency among SIPD, RA, and DBEs to enhance RPP-WTP safety decision making process. BNI stated that its RA methodology combined elements of both nuclear and chemical approaches. These elements were described on pages 10 and 11 of Attachment 4. To demonstrate its RA process, BNI provided an example at the meeting. The example was described in detail on pages 12 to 14 of Attachment 4.

The following is the summary of verbal exchanges between the OSR and BNI on the subject. OSR comments and questions are followed by the BNI responses.

- The OSR commented that a position paper entitled, "Conformance With Risk Goals in DOE/RL-96-006 (RL/REG-2000-08)", provides information relevant to the risk analysis that BNI is performing. The OSR understands the limitations and uncertainties associated with the risk assessment, and does not require that a full PRA be produced. For purpose of the construction authorization, order-of-magnitude comparisons to risk goals serve as a qualitative measure of the acceptability of the overall risk. If the results of this comparison are found to result in an estimated risk that is significantly higher than the risk goals, then engineering judgement should be made on whether a more detailed PRA of selected portions of the design is appropriate to better estimate the risk, and to identify design changes that appear to more closely meet the risk goals.

- What does decoupling individual accident sequence from consequence assessments mean? In a PRA performed for a nuclear reactor, the identification of an individual accident sequence is lost because of the fact that accidents are grouped together for analysis. As a result, the consequences can not be traced to individual accident sequence; hence they are decoupled. In the BNI RA, it is important to maintain this traceability to account for the potentially different and unique outcomes to the three different populations from the numerous identified accident sequences.
- What is the relationship of the risk analysis to the accident analysis? The accident analysis is included as part of ISM process controlling the design, and provides a conservative estimation of consequences. The risk analysis expands on identified DBEs to produce a best estimate consequence. This consequence is then multiplied by the accident frequency to produce a risk estimate. The summation of all accident risks is then used to compare against the risk goals.
- What is the linkage between the SIPD and the RA? The BNI RA relies on SIPD to identify hazardous conditions and associated hazard control strategies.
- Is a graded approach used by BNI in conducting the risk analysis? Yes. The risk analysis approach is unique since most PRAs are based on realistic analyses, not a mix of conservative and realistic analyses. Since there is a lack of final facility design information in several areas, using conservative estimates is acceptable, and will produce conservative results that can be used to determine the most important areas for a more refined analysis.

<u>ISM Evaluation (Attachment 4)</u>

As stated earlier by BNI, the development of the BNI RA relied on the results of the BNI ISM evaluation. The BNI ISM results were documented in SIPD. Each SIPD entry, called a control strategy development record (CSD), represents a unique hazardous condition identified during ISM meetings. BNI stated that it had more than 600 SIPD entries associated with HLW accidents. These included 175 events with either severity level (SL) 1 or 2 consequences. Of these 175 events, 20 were selected as DBEs for facility workers and 26 were selected as DBEs for co-located workers and the public. The link of the BNI RA process and its SIPD entries were described on pages 22 and 23 of Attachment 4.

BNI also stated that it maintained a RA database, which included a series of data tables, and system level failure rates, frequencies or conditional failure probabilities, derived from stand-alone calculations.

<u>ISM/DBE System Reliability Modeling (Attachment 4)</u>

BNI stated that its ISM/DBE system modeling process included the following steps:

- Develop a block diagram.
- Develop fault trees to represent system safety functions and event tree conditions.
- Apply reliability database to assign failure probabilities.
- Quantify fault trees.
- Document results and obtain review.

To provide an example of a block diagram, BNI presented the HLW C5 system block diagram. This was shown on page 29 of Attachment 4. To develop fault trees, BNI stated a description of a top event was required to describe the conditional failure of concern. Successive layers were then developed to break the top event down to basic events. The application of the reliability database to assign failure probabilities included selection of failure rate or demand failure probabilities based on best representative data. The objective of quantification of fault trees was to evaluate results to establish dominant contributors. BNI stated that its ISM/DBE modeling results were placed in a package, which references all supporting information and assumptions. The package was reviewed by BNI peers to ensure correct application of the methodology to the most current BNI design. The BNI ISM/DBE system analysis also included an event tree (ET) analysis, which was used to depict sequences and calculate event frequencies. The ET analysis was detailed on pages 35 and 36 of Attachment 4.

To perform risk calculations, BNI stated that its frequency and consequence information were combined in a two-step process to estimate risk to each population. The process included the following:

- Health effects correlation is combined with consequences to estimate the sequence conditional probability of fatality, either prompt or latent.
- Probability of fatality is combined with accident sequence frequency to calculate risks.

For health effects, BNI stated that the probability of fatal cancer due to acute exposure was 1E-03/rem for dosage greater than 10 rem and 4E-4/rem for less than 10 rem, and 100 rem was assumed to be the "de minimis" value when assuring compliance with risk goals for prompt fatality. For exposures above 100 rem, the probability of prompt fatality was assumed to be linear with exposure.

BNI emphasized that if its risk estimates are unacceptable, its calculations will be refined. The calculated BNI risk results will be compared with the site risk goals. If the calculated risk results were lower than risk goals, no further action will be required. If results are greater than goals, design changes will be implemented and accidents will be re-analyzed. BNI further stated that risk goal compliance for the HLW/LAW was demonstrated with an "a prior" process specific risk goals, because the risk from the PT building is unknown at present time. Therefore, for the HLW/LAW, this goal must reflect the partition of the facility-wide risk goal on the basis of the expected process specific contributions.

The following is the summary of verbal exchanges between the OSR and BNI on the subject. OSR comments and questions are followed by the BNI responses.

- Is BNI using commercial fault or event tree computer software? BNI is using WinNUPRA.
- Is the overall risk assessment process documented? Yes. In Appendix E of the ISM design guide (K70DG528_2).
- How is the reliability database maintained? The database is maintained in a simple Excel database, shown in the Appendix of the topical report. Conditional probabilities are evaluated by hand, where they apply. The entries come from several industry standard references.
- Can BNI provide the list of the references used to generate the reliability database? Yes. They will be part of the PSAR, but can be provided in advance as well.
- Is human reliability data considered? Yes, consistent with the approach defined in NUREG 1278 (Handbook of Human Reliability Analysis with Emphasis on Nuclear Power Plant Application).
- How will the reliability database be evaluated from a quality assurance (QA) perspective? BNI procedures require an independent, internal check of all entries against the reference materials. This effort has been completed.
- Is there any way to determine if there are missing initiating events or evaluate the uncertainty in the analysis? BNI is relying on the completeness of the HAZOP conducted by ISM teams.
- Where does BNI get the definition of system safety functions? The initial set was defined in the ISM process for ITS SSCs. However, the risk analysis expands this set to include non-ITS SSCs, where appropriate.
- How are the risk assessment calculations and results documented? The calculations are documented in draft calculation notes, consistent with BNI procedures, and the results will be described in the PSAR. The draft calculation notes will be made final once the design becomes final.
- BNI stated that its risk analysis approach was to use conservative assumptions in all areas. It was noted that BNI used 50% X/Q data. How is this conservative? In that case, a more realistic X/Q was used. However, in general, conservative assumptions are being applied.

<u>Topical Meeting Action Items</u>

1. BNI will provide the OSR with a colored figure containing example information on determining the LAW concentrate vessel contents. The black and white figure (page 21 of Attachment 3) was provided at the meeting.
2. BNI will provide the OSR with log/log dose distribution plots to show more detailed information near zero values.

3. More OSR questions on the topical meeting reports and the meeting are included in Attachment 5.

INFORMATION EXCHANGES

1. The OSR meeting presentation material
2. BNI handout on HLW/LAW seismic PRA preliminary results and operations risk goals assessment

ATTACHMENTS:

1. The meeting attendance list
2. The OSR Meeting Presentation Material
3. BNI handout on HLW/LAW seismic PRA preliminary results
4. BNI handout on operations risk assessment
5. Topical meeting action items.

Attachment 5

September 2001 Topical Report

LAW/HLW Seismic PRA Preliminary Results

1. The Topical Report does not consider secondary effects such as fires. It was stated in the meeting that fires will be addressed for the pretreatment facility because the resin beads are a source of flammable material. But for the LAW and HLW, combustible materials are assumed not to exist. Will secondary effects be addressed (e.g. seismic induced electrical fires, the collapse of weaker structures and equipment onto stronger ones, and the collision of unattached objects into equipment and structures) in the PSAR?

2. How will the conservative assumptions made for the fragility analysis of shear walls and shear wall penetrations be evaluated in future analyses, considering that these assumptions significantly affect the calculated consequence of a seismic accident?

3. Section 6.1 (page 65) states that it is conservatively assumed that the C5 Extract system is not available to mitigate the results of an accident involving a release of radioactive materials. Are there potential scenarios where the consequences (receptor doses) would be worse if the C5 system continued to operate in a damage state?

4. Section 6.3 (page 66) does not specify the confidence level of the quantified seismic risk curves presented in Figures 6-3 to 6-6. In the meeting the curves were reported to represent the mean. Why is the mean more appropriate and defensible than the median or 90 percentile for this application?

5. Has a verification of the HADCRT results against alternative methods of determining DFs for similar conditions over the duration of the accident events been conducted?

6. Is there a plausible physical explanation for the convergence of the DFs generated by HADCRT for penetrations with areas of 100 cm^2, 1,000 cm^2, and 1 m^2?

Interim Progress Report for the WTP Operations Risk Assessment

1. Section 4.10, 1st pp, states, "SL-3 and SL-4 events will be treated globally…" A qualitative treatment of SL-3 & SL-4 events assumes risk from these events will not be significant compared to the risk found by quantitative analysis of SL-1 & SL-2 events. In contrast to this assumption, a safety assessment performed for the DWPF SAR in 1993 found that low consequence/ high frequency events dominated risk. Also, the summary risk table in appendix D of the pre-topical submittal suggested that risk from the SL-3 & SL-4 events dominate overall risk for HLW. What evidence does the risk assessment team have that SL-3 & SL-4 events, as a group, will not contribute to or dominate the estimated risk?

2. Section 4.10, 2nd pp, 2nd bullet, states, "If the conservative analysis produces an unacceptable answer, the assumptions are refined and the risk contributions recalculated." It is not clear from the procedure described whether all accident sequences will be analyzed on an equal footing. If some individual accident sequences are treated conservatively while others are refined by performing more realistic "best-estimate" analysis, then a comparison of relative risk or a risk ranking of sequences will not be possible. How will the various contributions to total risk compare if some sequences are analyzed in a qualitatively different manner than others?

3. Appendix A, Table 8. The numbers in Table 8 for the frequency of loss of offsite power appear to be based on a CHG letter (CCN#016417C) dated November 8, 2000, from R. N. Hunt to J. Markille. This letter was cited in a BNI response to open items from the May/2000 topical meeting. The OSR reviewed the CHG letter and found that the information provided does not adequately respond to the issues raised on the May, 2000 topical meeting nor to earlier OSR comments on the facility blackout frequency submitted after the February, 2000 topical meeting. The OSR's comments on the facility blackout frequency calculations are summarized in letter 01-OSR-0276. What justification exists for continuing to use information about the frequency of loss of offsite power from letter CCN#016417C?

4. Section 3.0, 6th pp, states, "…the risk estimate will be refined, in accordance with DOE/RL 2001a guidance. This refinement for the RA may include reduction of conservatism (more realistic) in system and event tree models used in the DBE analysis." How will BNI determine a "conservative" sequence analysis for an event tree due to dependencies between accident sequences in the tree?

5. Will the criteria used in selecting data sources (e.g., a prioritized list of sources), beyond "engineering judgment, and the statistical distributions for each of the values in Appendix A be clearly defined?

6. Will the final modeling technique chosen allow for automatic elimination of component and system functional dependencies inherent in normal minimal cutset reduction, and include methods for accounting for spatial dependencies?

7. Are all accidents assumed to progress rapidly to the damage states of concern or is damage state timing included?

8. How will the "difficult to quantify" uncertainty associated with the final risk values be quantified or discussed?

9. How will information from the Excel spreadsheet be linked to WinNUPRA (bed database), and how will this process and the entries and calculations in the Excel spreadsheet be verified?